LED Standards and Test Methods Development

DOE-PNNL Involvement and Support

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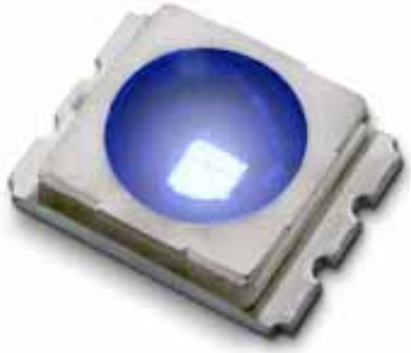
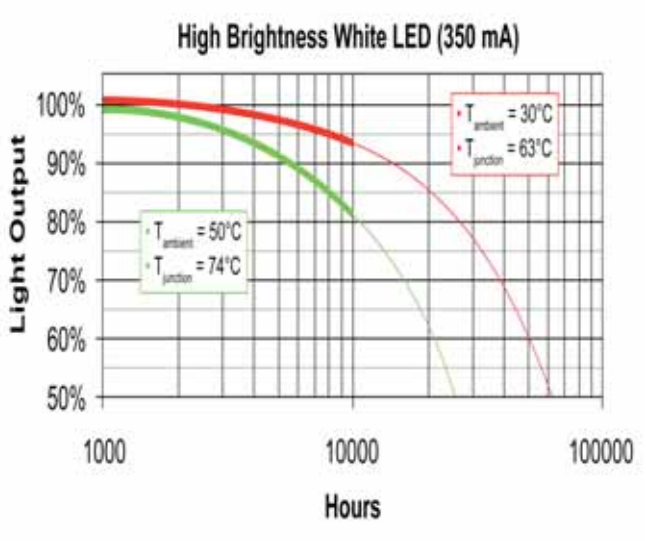


Issues – driving the need for standards

- **Energy efficiency -** competing with FL sources
- **Life** – need a better metric than failure
- **Heat effects**
  - Performance degradation
  - Life

…plus….

- **Color Preference**
  - Market needs
  - Cost



DOE Sponsored Standards Workshop - March 1, 2006

- Gathering of all standards and test methods organizations
- Review of LED standards and methods needs
- Review of development process and impacting timelines
- DOE providing on-going technical support for standards development.

Major Workshop Results

1) Standards and Test Method Needs Identified for Industry as well as Energy Star:
   - Photometric measurement
   - Electrical measurements
   - Life-testing
   - Chromaticity
   - Definitions

2) Standards development timeline
   - Typically measured in years but interest among individual members in moving faster
   - Standards groups chose the DOE Energy Star timeline as their development goal – striving for standards in the 2007 timeframe.

3) Memorandum of Understanding between IESNA and DOE

4) Assignment of Standards and Methods development responsibility

- ANSI/IESNA to work together on major development
- Working groups formed
  - Luminous Flux
  - Power
  - Color/Chromaticity
  - Definitions
  - Calibration of Equipment
  - Defined UL conditions of Acceptability
  - Mechanical and Electrical interchangeability

Working Group Activity – 2006/2007

- ANSI/IESNA combined meetings
  - Report on progress of working groups
  - Address combined issues – monitor development in meeting industry and Energy Star needs
  - Identify process support needs to DOE

- ANSI/IESNA specific group conference calls
  - Continue specific group development
  - Consider manufacturer issues and market needs
  - NEMA and DOE hosted calls

Performance Standards and Test Methods Status

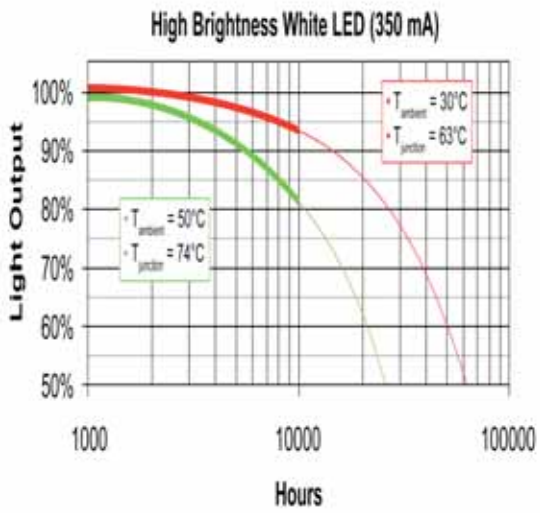
- SSL/LED Performance Standards/Test Methods – ANSI/IESNA
  - IESNA RP-16 Nomenclature/Definitions for Illuminating Engineers (Currently in ANSI review)
  - IESNA LM-80 Lifetime (Draft under final revision)
  - IESNA LM-79 Electrical and Photometric Measurements (Completing final committee review)
  - ANSI C78.377A Specification for Chromaticity of White SSL Products (Completing final committee review)
  - ANSI C82.XX1 Power Supply (Current draft out for comment)
  - UL “Outline of Investigation” (In draft for industry review)
- Final Draft performance standards/test methods expected - July 2007

IESNA LM-79 - Electrical and Photometric Measurements

- Method for performing reproducible measurements of total flux, electrical power, efficacy (lum/watt), and chromaticity
- Applies to LED luminaires as well as LED sources used in luminaires (e.g., replacement of screw base incandescent lamps)

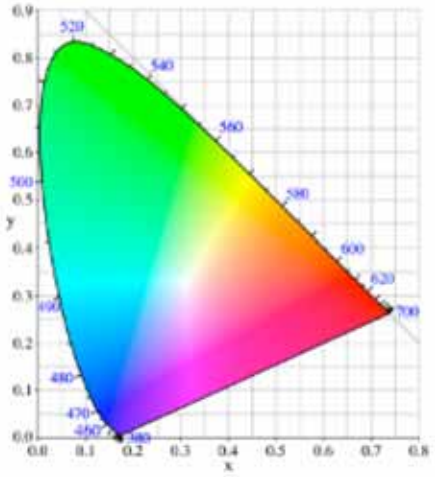
IESNA LM-80 - Lumen Depreciation (Lifetime) Test Method

- Addresses lumen depreciation testing of solid-state (LED) light sources, arrays and modules only
- Does not cover measurement of luminaires.
- Incorporates the LRC ASSIST LM-50, LM-70 metrics



ANSI C78.377A - Specification for Chromaticity of White SSL Products

- Specifies the range of chromaticities recommended for general lighting
- Applies to general indoor applications and some outdoor applications where white light is critical.



IESNA RP-16 - Nomenclature/Definitions for Illuminating Engineers

- A revision to the current RP-16 document
- Revision will incorporate and define appropriate LED related terms.

ANSI C82.XXX – LED Drivers

- Provides specifications/operating characteristics of electronic drivers (power supplies) for LED devices, arrays, or systems
- Applies to drivers operating up to 600V and frequencies of 50 or 60 hertz as well as above 20 kHz

UL "Outline of investigation" for LED products

- The "Outline" Coordinates existing UL standards as applicable to LEDs
- Standards technical panel being formed to support development of UL 8750 for LED products

Development Process Involvement

Both ANSI and IESNA processes are always interested in useful participation

- For ANSI, contact Ron Runkles - ron_runkles@nema.org
- For IESNA, contact Kevin Dowling - kevin@colorkinetics.com
- For UL, contact Eli Puszkar – eli.puszkar@us.ul.com